18 April 2008

M E M O R A N D U M

TO: Thomas Rackow, P.E.
Idaho Falls Regional Office

FROM: Tina Kurtz, Scientist I
Technical Services

SUBJECT: Basic American Foods-Rexburg Wastewater Reuse Permit Application Review -- LA-000040-02 (Industrial Wastewater Facility)

1.0 Purpose

The purpose of this memorandum is to satisfy the requirements of IDAPA 58.01.17.400 (Rules for the Reclamation and Reuse of Municipal and Industrial Wastewater) for issuing wastewater reuse permits. It states the principal facts and significant questions considered in preparing the draft permit conditions or intent to deny, and a summary of the basis for approval or denial with references to applicable requirements and supporting materials.

2.0 Process Description

Basic American Foods (BAF) operates a potato dehydrating facility located just northeast of Rexburg, Idaho. The facility owns 739.6 acres, 220.1 of which are located adjacent to the facility itself at the Plant Farm and the remaining 519.5 of which are located approximately 4 miles further northeast at the Salem Farm. Currently, land application takes place on 186.5 acres of the Plant Farm and 420 acres of the Salem Farm, for a total of 606.5 acres. As will be discussed below in Section 4.4 the facility seeks to bring into service some additional acreage adjacent to these existing sites in order to reduce both hydraulic and constituent loadings to their current land application areas.

BAF-Rexburg is considered to be operational for approximately 365 days per year, with 3 year average annual generation rate of 353 million gallons (MG) (2005-2007) and a somewhat lower 6 year average of 339 MG (2002-2007); however, as will be discussed in Sections 4.5.1 and 4.5.2.3 the facility is proposing to increase this amount. The wastewater generated at the facility consists mainly of potato process water which is subject to primary treatment via screening and clarification prior to being land applied. In addition to the process water, the facility also receives water from the adjacent fresh pack shed which is first screened, sent to the mud settling pits, and then to the main surge tank with the rest of the wastewater for land application.

3.0 Summary of Events

The facility received its initial wastewater reuse permit (LA-000040) on February 14, 1991. A permit renewal application was submitted on January 31, 2003. Due to a number of changes to the land application system, BAF submitted an update to this application in November of 2006. During this process the facility has continued to operate under their initial permit LA-000040.

4.0 Discussion

The following is a discussion of: soils, ground water, surface water, hydraulic field configuration, wastewater flows, constituent loading, and site management and compliance activities. Conclusions and recommendations are summarized in Section 5 below.

4.1 Soils

Soils on both the Plant Farm and a portion of Salem Farm were characterized by CES in 2005. The remainder of the Salem Farm was characterized by CES in 1988, prior to the commencement of land application at the site.

4.1.1 Soils at the Plant Farm

At the Plant Farm CES dug 21 test pits across the site and was thereby able to divide the area into five soil mapping units: Soil Unit A, Soil Unit B, Soil Unit C, Soil Unit D, and Soil Unit E. It should be noted that the northern half of the site (fields A-1, A-2, and A-3) is situated on a terrace which is 5-10 feet higher than the remainder of the site, a distinction which also appears to be reflected in the soil quality.

Soil Unit A consists of well drained, gravelly loam to 8 inches which then becomes very gravelly sandy loam to 14 inches, overlying a substratum of extremely gravelly sand. This unit occupies sections of the fields currently known as A-4a and A-4b as well as the majority of A-6, for a total of 53 acres. Test pits in the area of A-6 contained ground water at depths ranging from 42 to 50 inches and exhibited mottling at depths ranging from 12 to 24 inches, indicating that soils in this area are somewhat poorly drained. The available water holding capacity (AWC), or water held in the soil which is available for crop use, is classified as severe at just 1.9 inches (CES, 2006).

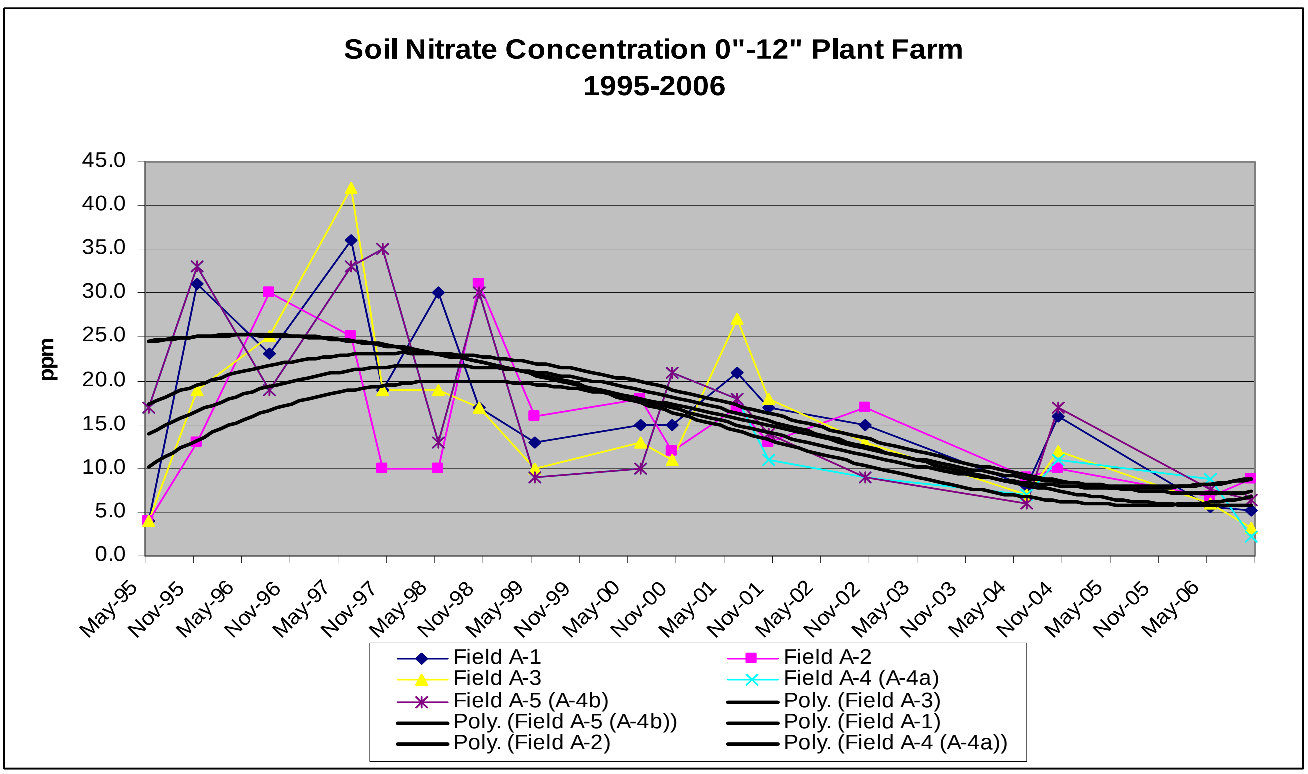
Soil Unit B is composed of deep, well drained loam to 12 inches and a second horizon which has a loam texture to a depth of 28 inches. The next two horizons, from 28 to 60 inches are composed of fine loamy sand horizons, differing only in the presence of calcium carbonate from 28 to 38 inches. This unit is covers approximately 17 acres in the lower portions of fields A-4b, and to a lesser extent A-4a, adjacent to the Teton River. This unit's AWC is classified as moderate at 5.7 inches (CES, 2006).

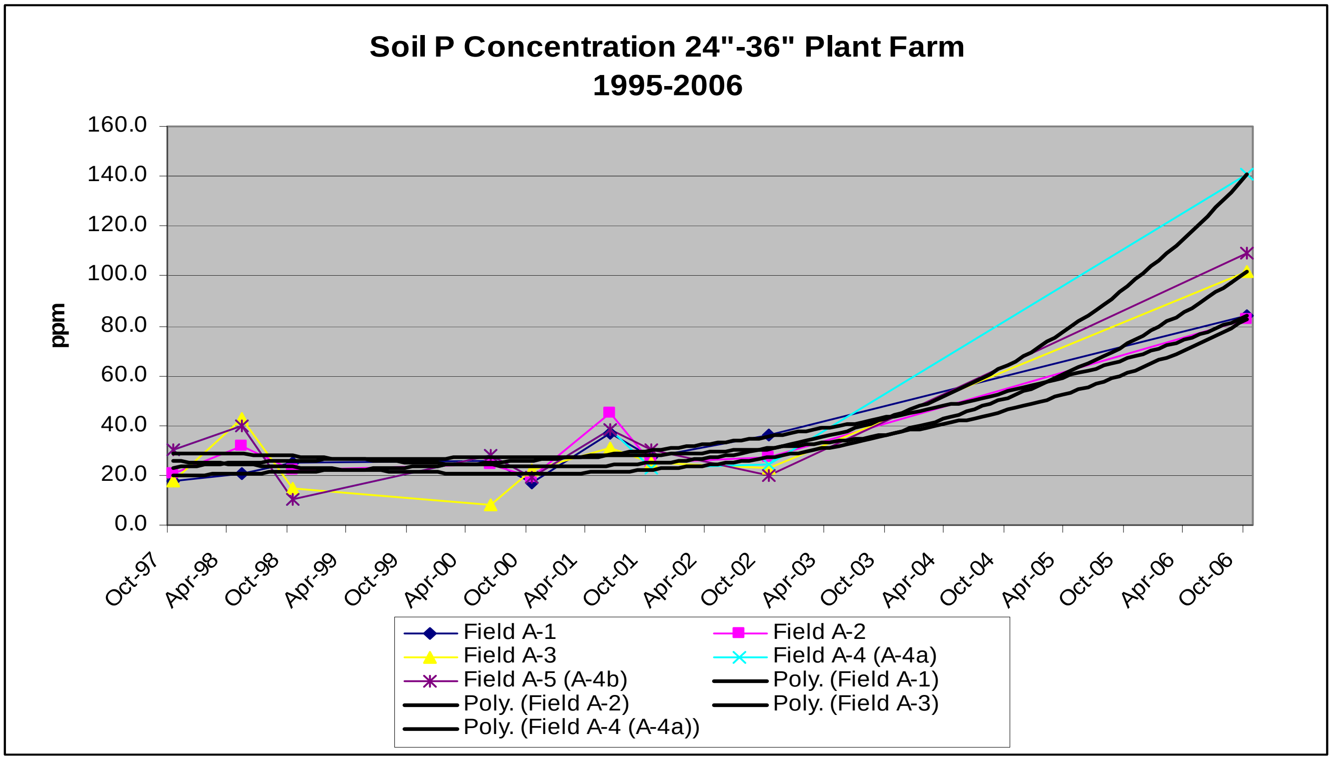
Soil Unit C, the dominant soil at the site, is sandy loam to 11 inches, overlaying three slightly different loam horizons with bottom depths of 25, 48, and 60 inches. Faint, fine mottles were observed in Test Pit 18 at 46 inches below ground surface (bgs) and in Test Pit 20 at 32 inches bgs. These test pits were located in fields A-2, and A-1, respectively, both of which were formerly flood irrigated. This is the dominant unit on the higher terrace, covering 156 acres and fields A-1, A-2, A-3 as well as their respective pivot corners. At 8.3 inches, this unit has the highest AWC of the site and is subsequently rated as slight (CES, 2006).

Soil Unit D has a loamy surface which overlays a clay loam horizon that extends from 13 to 37 inches with a few faint mottles. Beyond 37 inches, the soil becomes a gravelly coarse sand texture with many coarse, prominent mottles. This unit is characterized as somewhat poorly drained due to the observed presence of ground water at 54 inches and few, faint and small mottles at 13 inches, with mottles increasing in size and distinctness from 37 to 60 inches. The AWC for this unit also rated slight, at 6.2 inches (CES, 2006). Unit D is located on 5.7 acres within field A-6, which is also composed of the mottled portions of Unit A. It should be noted that until the facility converted its irrigation practices from flood to pivot this field was considered to be a wetland and as such, unavailable for land application; this issue will be discussed further in Section 4.4.

Soil Unit E is the facility's former tare dirt site and consequently has notably different soil content than the other areas on the farm; the parcel was included in the survey because the facility wishes to begin land applying to it. The 6.4 acre unit, designated as field A-7, has been covered with 5 to 10 feet of soil washed from potatoes prior to processing as well as minor amounts of ash and clinker from the plant's wood-fired boiler. Five layers were observed in the cover material with soil textures ranging from gravelly (15 to 35% of the particles were 2mm to 75mm) to extremely gravelly (>60% gravel). This unit was given a moderate AWC of 3.5 inches (CES, 2006).

Despite the historical constituent overloading at this site, the majority of the chemical parameters sampled for are within the low to moderate range, with a few notable exceptions. Please refer to the graphs below for site soil constituent concentration trends from 1995 to 2006. Note: Soil samplings for plant available phosphorus were not performed in 1999, 2003, and 2004 so data points are not included for these years. Soil sampling data for 2005 was not accepted due to discrepancies in methods used by the facility's lab and as a result no data for this year is included for any constituent.





According to previous annual report data, all of the fields currently in use at the Plant Farm have been both constituently and hydraulically overloaded at one point in time (BAF, 1996-2007). Evidence of this overloading can be seen in high levels of both nitrate and potassium which were almost universally present at the site throughout the mid to late '90s. Soil nitrates have, however, shown a steady decrease in concentration to levels which are considered to be low. While much of this trend could be attributed to decreasing nitrogen loadings to the site, a portion of it may also be the result of nitrogen's reduction to gaseous forms under anaerobic soil conditions as well as leaching, both due to the high non-growing season hydraulic loading rates typically employed at the Plant Farm; for further discussion of nitrogen and non-growing season hydraulic loading rate trends see Sections 4.5.2.1 and 4.5.2.3.

Unlike nitrogen levels, the plant available phosphorus levels have shown a fairly steady increase over the last ten years, with a marked jump. No sampling values were available for the constituent between 2002-2006. In 2002 concentrations on the majority of the site were considered to be in the moderate range with a few areas classified as high; in 2006 the entire site was well into the very high range. These elevated levels are a concern, as there is evidence of a ground water to surface water interconnection, given that ground water flows generally east to west in the direction of the Teton River which borders the site. For further discussion of ground water flow and the ground water to surface water interconnection see Sections 4.2.1 and 4.3.

In addition to the elevated levels found on the fields currently in use, the facility is proposing to put their former solid waste disposal site into service in a land application capacity. When CES characterized the site in 2005, it was found to have extremely high levels of both nitrate nitrogen (NO_3-N) and sulfate sulfur (SO_4-S), within one acre-foot of Unit E or A-7 containing an average of nearly 300 lbs of NO_3-N and 374 lbs of plant-available sulfur. As a result of these samplings, CES recommended mitigation prior to employing the field for land application purposes (CES, 2006). DEQ concurs with this conclusion and consequently recommends that the facility submit a Site Remediation Plan, including a schedule for implementation and subsequent soil sampling. Following the implementation of this plan and satisfactory remediation of the field, the facility can then apply for a permit modification to begin employing A-7 for land application purposes; it is not recommended, however, that the field be permitted as a management unit at this time. For the full text of this compliance activity see the Section E, CA-040-05 of the permit.

4.1.2 Soils at the Salem Farm

During the original 1988 survey at the Salem Farm, CES dug 14 test pits across the site and was thereby able to classify the soils according to the US Department of Agriculture (USDA) system. Over 75% of the soil at Salem Farm was determined to be St. Anthony, gravelly sandy loam, which is moderately deep and somewhat excessively drained. At the surface, between 0 and 8 inches, these soils are typically gravelly sandy loam or sandy clay loam with 15 to 35% gravel. From 8 to 33 inches they are characterized as very gravelly sandy loam or sandy clay loam with 35 to 60% gravel; and the finally, from 33 to 60 inches the soils are composed of extremely gravelly coarse sand with a loose, single grained structure and greater than 60% gravel (CES, 1988).

While the vast majority of the Salem Farm is indeed St. Anthony gravelly sandy loam, CES noted two separate areas of contrasting soil inclusions, one in the southwest corner of what is now field S-1 the other in southeast corner of field S-5. A heavy textured sandy clay loam over gravelly sandy clay loam was observed in the section of S-1 but was not determined to be limiting with regard to land application purposes. The area in S-5 was determined to be located in an alluvial depression and composed of poorly structured heavy silty clay loams which could be limiting to within the scope of land application (CES, 1988).

The entirety of S-5 and its adjacent property was re-characterized by CES in 2005 and the structures and limitations of this particular field were explored more thoroughly. During the 2005 characterization 8 test pits were dug and the 91.9 acre section was divided into four distinct soil mapping units. The soil found in Unit A is characteristically the same as that found on the bulk of Salem site, occupying 59 acres of S-5; it is a well drained gravelly sandy loam from 0 to 12 inches, becoming extremely gravelly sandy loam to 20 inches and finally extremely gravelly sand from 20 to 50 inches. The AWC for this soil type up to a depth of 60 inches was determined to be 3.10 inches (CES, 2006).

Soil Unit B was, at the time of the survey, the second most prevalent unit on the field, covering approximately 17 acres. Soils in this area were identified as Wardboro gravelly sandy loam, characterized as extremely gravelly and excessively drained. The gravelly nature of this soil coupled with the presence of channeling on the surface was indicative of recent erosion by running water; reportedly due to the resultant flood following the 1976 Teton Dam failure (CES, 2006). Much of the area on S-5 that was comprised of soil unit B was augmented in the summer of 2006 with soils from units C and D in an attempt by the facility to improve the site for potential land application purposes.

Prior to the facility's dirt shuffling, Unit C occupied two inclusions within Unit B with a combined total area of approximately 8 acres. This type of soil has been identified as Heiseton loam and is moderately well drained, composed of clay loam at the surface, and possesses some mottling in the lower horizons due to shallow ground water. Unit D was also characterized as Heiseton loam and occupied 7.9 acres in the far southeast corner of the site. This soil is very similar to the soils found in type C; however, the gravel substratum is not as deep, extending to 26 inches bgs rather than 30 inches (CES, 2006).

Salem Farm has only been employed for land application since 1994 and an effort has been made by the facility to maintain guideline rates in terms of constituent loadings; in general this has been reflected in the soil constituent concentrations. Since 1998, soil nitrate nitrogen concentrations have remained fairly constant, fluctuating from very low to moderate levels (between 3.0 pmm – 15.00 pmm) in the top 36 inches of soil.

Phosphorus levels, too, have been consistent since 1998. Unlike the nitrate levels, however, phosphorus levels have been perpetually within the high to very high range (between 28.00 pmm – 82.00 pmm) in the top 36 inches of soil. These high phosphorus levels are again a possible concern due to evidence which suggests that aquifer flow is toward the south/southwest in the general direction of the North Fork of the Teton River which is located about a ½ mile south of the site. For further discussion of ground water flow and the ground water to surface water interconnections see Sections 4.2.2 and 4.3.

Like concentrations at the Plant Farm, potassium levels at the Salem Farm showed an increase, albeit not as marked, following the three year cessation in sampling from 2002-2006. In 2002 levels at the site were at either the high end of the moderate range or the low end of the high range (between 370-435 pmm) , however, when sampling resumed in 2006 levels were found to be towards the upper end of the high range (between 520 pmm – 650 pmm). Again, while high potassium concentrations are common in the land application of potato process water and, while not necessarily a permitting concern, excessive concentrations may lead to an overbalance of the magnesium/potassium ratio in the crop and subsequently the aforementioned grass tetany.

BAF is requesting to add Fields S-5 and S-6 to the new permit. Toward this aim, soils in S-5 were sampled for a number of chemical constituents in 2005 and 2006. While phosphorus levels were again found to be high on this unit, the nitrate and potassium levels were well within the low to moderate range for all soil levels. In terms of employing this area for long term land application purposes it appears that the quality of the soil, rather than its chemical concentrations, that will prove to be the greatest limiting factor. For further discussion of soil limitations in terms of hydraulic loading rates see Section 4.5.2.3.

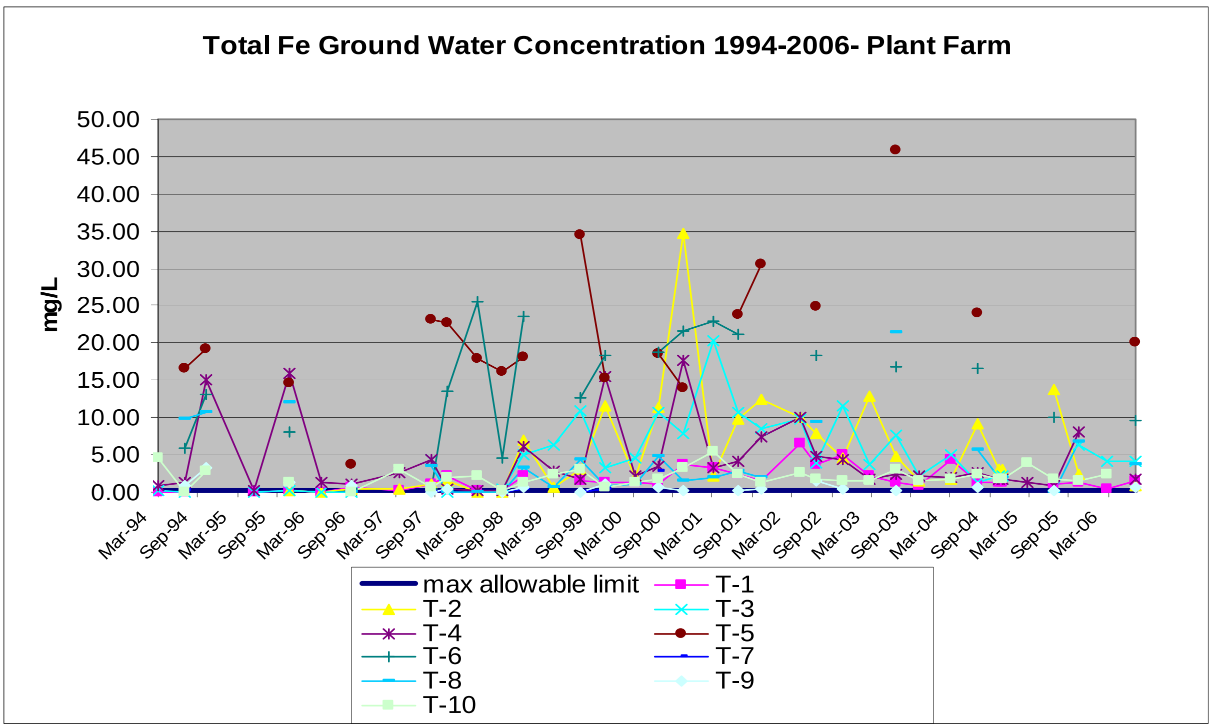
4.2 Ground Water

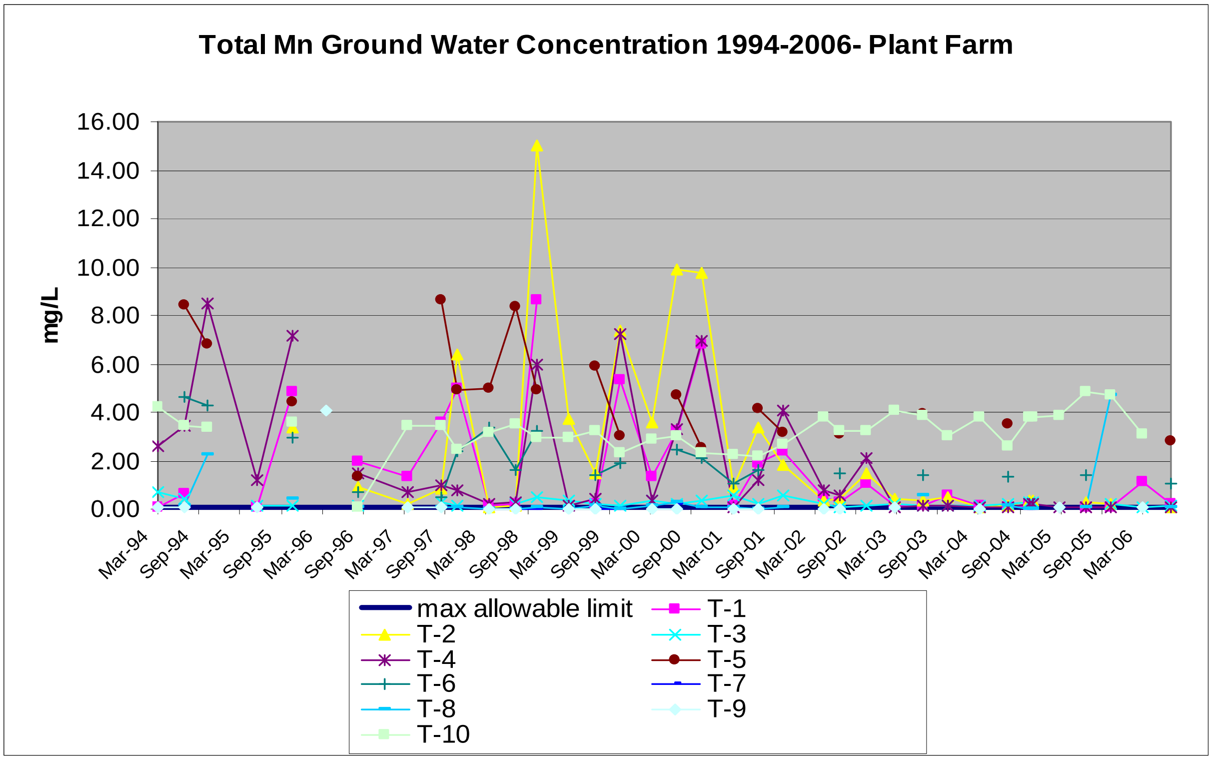
Both the Plant Farm and the Salem Farm are located on alluvial lowland and floodplains, near the edge of the Rexburg bench. These Quaternary and Recent Age alluvial deposits are comprised of gravels, sand, silt, and clays. The depth to regional ground water is approximately 50 feet below ground surface, starting in the alluvial deposits and extending into the underlying basalt. Aquifer recharge takes place to the southwest in the Rexburg Bench area and discharges to Henry's Fork or the Snake River Plain Aquifer in the west (HDR, 2006).

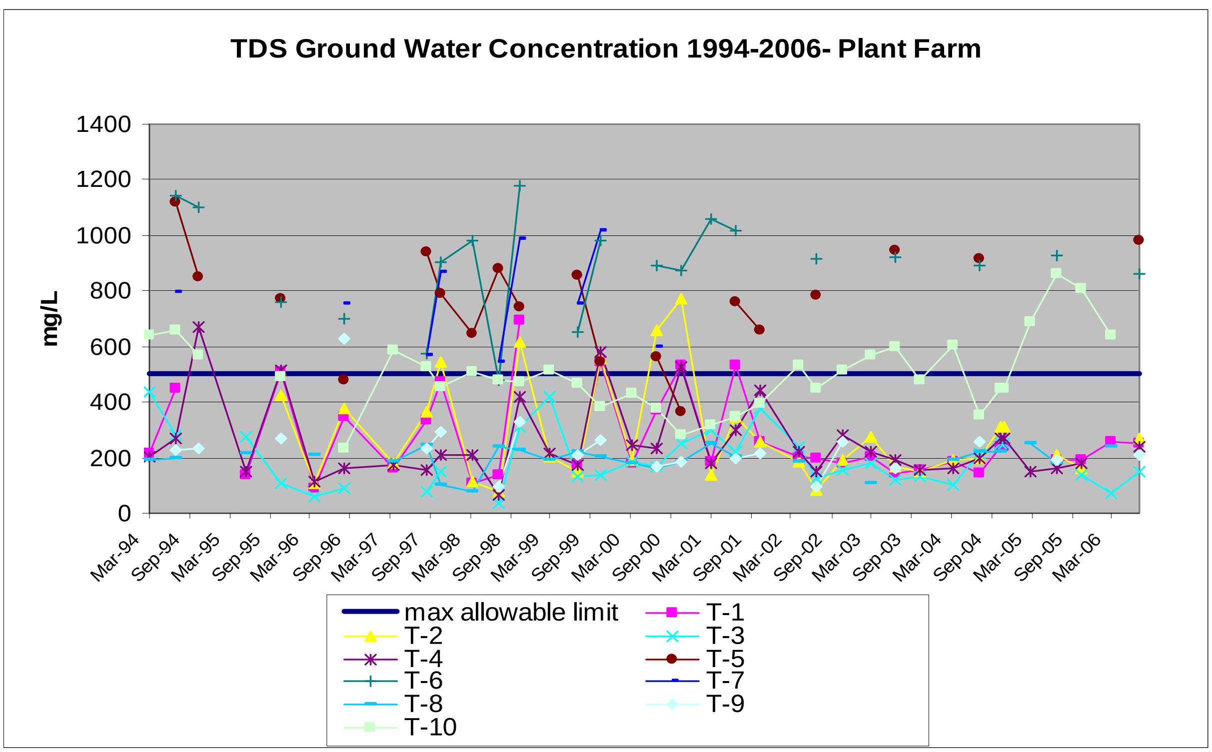
4.2.1 Ground Water at the Plant Farm

The amount of surface water present around the Plant Farm, particularly the South Fork of the Teton River, provides a significant influence upon the ground water beneath the site. Generally, ground water flows east to west/southwest, toward the river, which borders the farm on both the southern and western sides. According to the facility, the ground water gradient appears to range from approximately 0.0004 to 0.0033 ft/ft, with an average gradient of 0.002 ft/ft; however, some question exists as to whether the wellheads elevations have been surveyed accurately. In addition to this regional ground water, there also exists a perched water system between 5 to 10 feet below ground surface, recharged by precipitation, irrigation practices, and the seasonal variations of the Teton River (HDR, 2006).

The Plant Farm has a network of ten monitoring wells, all of which are screened in the perched zone, with the exception of well T-10, which is 65 feet deep(See Appendix 2, Figure 1). Monitoring wells T-8 and T-9, located in the upper northeast corner of the site and the northern boundary of the site, respectively, function as the facility's up-gradient wells, while the remainder of the wells function as either cross-gradient or down-gradient wells for the various fields or the farm as a whole. Water levels in wells T-1 through T-4, which border the river, typically fluctuate a few feet seasonally with the corresponding river elevations. On the other hand, levels in the inland wells, T-5 through T-10, can vary much more significantly throughout the year (HDR, 2006). This degree of variation coupled with the shallow depth of the majority of the wells leads to many instances during the facility's thrice annual sampling cycle (spring, summer, and fall) where several of the wells are dry. Please refer to the plots below for ground water constituent concentration trends from 1994-2006 in comparison with their relevant ground water quality standard (IDAPA 58.01.11.200.01). Note: All non-detect or less than values have been designated as the laboratory's corresponding minimum reporting limit for graphing purposes.







As evidenced by the graphs above, a number of the facility's wells have been in exceedance of the ground water quality standard for total dissolved solids (TDS) on a fairly regular basis and the majority of the wells are consistently above the standards for both total iron and total manganese. The Ground Water Quality Rule (IDAPA 58.01.11) gives the secondary constituent standards for iron and manganese as 0.3 milligrams per liter (mg/L) and 0.05 mg/L, respectively. Many of the samplings have exceeded these standards by a fairly significant amount, with results ranging from 1.00 mg/L to 5.00 mg/L and well above for both constituents. The facility has attributed the elevated levels to historical contamination at the site and has also performed a number of dissolved samplings to determine the extent to which turbidity may contribute to these levels. Please see Appendix 1, Table 1 for a comparison of the total and dissolved results for both constituents.

As previously discussed, and demonstrated in Table 1, exceedance of the ground water quality standards for total iron and manganese is the rule rather than the exception, even for the facility's up-gradient wells. However, as illustrated in the table, it also appears as if a fair amount of the elevated iron levels may be due in part to a certain amount of turbidity or possibly the wells' steel casings, given the fact that the bulk of the dissolved iron samplings come in below the secondary standard, with the notable exceptions of wells T-6 and T-10. At the same time, there appears to be little variance between the total and dissolved sampling for manganese, indicating that not only do these wells exceed the ground water standard but also that turbidity plays little part in this exceedance, with the exception of the up-gradient well T-8.

Generally, the presence of high concentrations of iron and manganese in monitoring wells indicates anoxic conditions in the soil which have lead to the reduction of these minerals to their soluble and mobile forms, thereby freeing them to leach into the ground water at the site (DEQ, 2006). In this case the anoxic conditions are most likely due to the consistently high hydraulic loading rates which the fields at the Plant Farm have experienced during the non-growing season, causing the soils to be often waterlogged and therefore oxygen-depleted. For further discussion of historic hydraulic loading rates and permit recommendations see Section 4.5.2.3.

As has been previously mentioned, there has been some question as to the accuracy of the wellhead elevations, as they appear to have changed somewhat from year to year and at times indicate water table elevations which are greater than the completed well depths. It is for these reasons which staff recommends that the T-series wells be resurveyed by an Idaho licensed land surveyor. For the details of this compliance activity, see CA-040-06 in Section E of the permit. If a survey by one of the aforementioned professionals has, in fact, been performed previously, it is requested that documentation to this effect be produced as fulfillment of the requirements of the compliance activity.

In addition, it is apparent that over the past few years a number of the wells, namely T-5 through T-10, have failed to yield enough water for adequate samplings on a number of occasions. In order to remedy this issue it is also recommended that these wells be recompleted, or new wells drilled as applicable, as part of a Ground Water Characterization Plan, so that the wells yield samples throughout the year. For the full text of this compliance activity see CA-040-07 in Section E of the permit.

4.2.2 Ground Water at the Salem Farm

Like the Plant Farm, ground water at the Salem Farm appears to experience considerable influence from surface waters surrounding the site. The North Fork of the Teton River flows a half mile south of the farm while the Salem Union Canal and its branches border the farm on three sides, in addition to flowing between fields S-2 and S-3 (HDR, 2006).

The Salem Farm has a network of ten monitoring wells, five completed to various depths consistent with the regional aquifer and five screened in the shallow alluvial aquifer. The F-series, or deep wells, are sealed between 45 to 65 feet bgs and were installed in 1987. The FM-series, or shallow wells, are 25 feet deep, screened for the lower 10 feet, and were installed adjacent to the F-series wells in 1989 (See

Appendix 2, Figure 2). The hydrographs for these paired wells indicated water level fluctuations occur simultaneously through the entire saturated thickness of the alluvial aquifer indicating a hydraulic connection the vertical direction. Generally, regional ground water flow in the area is to the west and southwest with recharge surface water moving in part vertically downward and in part laterally, discharging to down-gradient streams such as the North Fork of the Teton River. However, due to localized mounding, ground water flow beneath the site often does not coincide with expected flow patterns (CES, 1991). Flow measured by CES in 1991 in the FM series wells appear to be in a variety of directions, predominately trending towards well FM-4; a pattern which is attributed to influence from irrigation wells and canals, and recharge from surrounding flood irrigation towards areas of non-flood irrigation. This flow pattern occurs again in HDR's November 2004 water table map, however, it seems unlikely that ground water flow would be influenced by irrigation practices at that time of year. These flow patterns are unusual enough to warrant a resurvey of the site's wells. It is recommended that the facility have these wells, along with the aforementioned T-series wells at the Plant Farm, resurveyed by an Idaho licensed land surveyor. For the full text of this compliance activity see CA-040-06 in Section E of the permit.

The wells at the Salem Farm for the most part do not share the Plant Farm's issues with elevated iron, manganese and TDS; there are, however, still a few which have elevated constituent levels. Foremost among these is F-4; while most of the F-series wells show a chemical signature similar to that of the surrounding irrigation water, F-4 has significantly elevated levels of chlorine and has shown high levels of both nitrate (~7 to ~10 mg/l) and TDS (~450 mg/l). The well itself is located near the northern boundary of an abandoned feedlot which is now being employed for wastewater reuse, making it likely that it is the legacy of the feedlot rather than the land application activities which is contributing to the anomalously high chemical concentrations. Recent spikes (2005-2006) in the nitrate levels in the well could again be attributed to this source as the facility just recently expanded pivots S-2 and S-3 further into the feedlot area.

The shallow series well FM-0 also shows consistently elevated levels of both nitrate (~10 to ~40 mg/l) and TDS (~300 to ~700 mg/l) when there is sufficient water available for sampling. While this well is near an active feedlot which is located to the south of S-2 and S-3, uncertainty in ground water flow direction makes it difficult to pinpoint any direct influence from this, or any other source. It seems highly unlikely, however, given the lower nitrate levels in the remainder of the wells (~1 to ~4 mg/l) that these concentrations are solely due to land application activities.

As a result of the number of uncertainties which still exist with regard to the ground water at the Salem Farm, it is recommended that a Ground Water Characterization Plan, CA-040-05 in the permit, be implemented which includes the following: 1) FM Series wells be recompleted, or new wells drilled as necessary, so the wells yield samples throughout the year and be sampled as close to the water table as possible, 2) proposed wells FM-5, FM-6, FM-7, and FM-8 be completed in a similar manner, 3) plans and specifications for both the proposed wells and the updates to the current FM series wells be submitted to DEQ for approval prior to construction. For the full text of this compliance activity see CA-040-07 in Section E of the permit.

The aforementioned variety of completion depths in the deep F-series wells makes potentoiometric data from these wells understandably difficult to interpret, however, the chemical data from these wells appears to be of rather dubious value as well. Higher constituent concentrations would typically be expected in the upper water table, decreasing with aquifer depth and distance away from surface contaminant influences. While a few of the well pairings (FM-0/F-0, FM-2/F-2, FM-3/F-3) do somewhat adhere to this pattern, a number of them (FM-1/F-1 and FM-4/F-4) do not, possibly due to direct and local influence on the shallow wells by irrigation laterals. Due to the difficulty in interpreting the deep monitoring well network's data as it relates to surface impacts and upper aquifer conditions, it is recommended that these wells no longer be monitored, and that a revised monitoring well network be devised.

Though the Plant Farm and the Salem Farm wells are still in exceedance of a number of ground water standards, namely those for TDS, Fe, and Mn; the level of exceedance has decreased somewhat over the past few years, in part due to the facility's efforts to reduce non-growing season hydraulic overloading. With the new non-growing season loading limits which are tailored to each fields' AWC and the improvements to the monitoring well networks which are required by CA-040-06 and CA-040-07, these levels should continue to decrease and a more accurate picture of the both site's ground water can be developed.

4.2.3 Domestic Water Supply Wells in the Vicinity

In addition to the monitoring wells present at the sites there are a number of domestic wells within a quarter mile radius of the Plant Farm and Salem Farm. In September of 2006 the facility performed samplings on a number of the wells within the radius of the Salem Farm. These wells were sampled for a number of constituents including: total and dissolved iron and manganese, nitrate, chloride, sulfate, sodium, potassium, calcium, magnesium, bicarbonate, and total dissolved solids. Out of the parameters sampled, all were below the applicable primary or secondary ground water standards. DEQ recommends that well location acceptability analyses be performed on all applicable surrounding wells and for any domestic or municipal wells located on the reuse sites themselves. For the full text of this condition see CA-040-08 in Section E of the permit.

There is one municipal system, that of Hibbard Elementary School, whose well is located within the six year time-of-travel (TOT) zone for the Plant Farm. DEQ completed a source water assessment on this system in 2002 and gave the well a moderate overall susceptibility ratings for inorganic (IOCs), synthetic organic (SOCs), volatile organic (VOCs), and microbial contaminants. These ratings can be attributed mainly to soil quality at the site as well as the area's intense agricultural practices and accompanying chemicals. Despite these ratings, however, no SOCs, VOCs, or microbial contaminants have ever been detected in the well according to the Safe Drinking Water Information System (SDWIS). While the IOC nitrate has been detected in the well; levels have consistently been far below the maximum contaminant level (MCL) of 10 mg/l (SDWISS, 2007).

DEQ also completed a source water assessment on BAF's production wells in 2001, which are located adjacent to the plant and generally up/cross-gradient to the land application site. Both the Kipper Well and the Main Wells were given high overall susceptibility ratings for IOCs, SOCs, VOCs, and microbial contaminants due to hydrologic sensitivity, system construction, and agricultural land use (DEQ, 2001). Again, despite this rating no IOCs, SOCs, VOCs, or microbial contaminants have ever been detected above MCLs in the either of the wells according to SDWIS (SDWISS, 2007).

4.3 Surface Water

There are a variety of surface waters in the vicinity of the Plant Farm and the Salem Farm. At the Plant Farm, the site itself is bordered on the southern and southeastern sides by the South Fork of the Teton River. According to the Federal Emergency Management Agency (FEMA) a portion of the lower half of the Plant Farm, or fields A-6, A-4a, A-4b and a section of A-3, are located in the 100-year floodplain for the Teton River (FEMA, 2003). In addition to the river, there are jurisdictional wetlands located directly adjacent to field A-6. These wetlands are semi-permanently to permanently flooded to saturated and represent approximately 3.0 acres, influenced by river and possibly canal flows (Hoschouer, 2003).

At the Salem Farm the Salem Union Canal borders the site on the northwest, northern, and southern sides, as well as running between fields S-2 and S-3. The North Fork of the Teton River is located approximately a half mile to the south while the North Fork of the Snake River, known as Henry's Fork, is located 2 miles to the north. The Salem Farm, unlike the Plant Farm, appears to be located just outside the 100 year floodplain for the Teton River and is well outside the floodplain for Henry's Fork (FEMA, 2003).

4.4 Hydraulic Management Unit Configuration

There have been a number of fairly significant changes in management configuration as well as irrigation practice since the facility's original permit was issued in 1991. In addition to these changes, BAF is proposing several additional fields at both the Plant Farm and the Salem Farm.

Initially, the Plant Farm contained a number of flood and sprinkler fields, and only one pivot. Over the years all of the fields have been converted to pivot irrigation, with flood and big gun irrigation for the corners; the final pivots having been erected in May of 2006. Naturally, this has resulted in some changes in both hydraulic field configuration as well as nomenclature. Also, BAF is proposing some changes to the currently used labeling system for these fields to be included in the new permit. Please refer to Table 1 below for a description of the proposed management units and acreages at the Plant Farm.

Table 1. Management Unit Configuration at the Plant Farm

Serial Number	Site ID	Acreage	Irrigation System Type
MU-004001	A-1	25.3	Pivot
MU-004002	A-2	47.8	Pivot
MU-004003	A-3	29.0	Pivot
MU-004004	A-4 (formerly A-4a)	22.7	Pivot
MU-004005	A-5 (formerly A-4b)	24.4	Pivot
MU-004006	A-6 (formerly A-5)[1]	17.6	Pivot
MU-004007	A-7[2]	N/A	N/A
MU-004008	C-1 (corner)	4.5	Sprinkler (GS)/Flood (NGS)
MU-004009	C-2 (corner)	13.4	Flood
MU-004010	C-3 (corner)	8.5	Sprinkler
MU-004011	C-4 (corner)	9.5	Flood
	Total acres:	**202.7**	

1. Field A-6 was originally permitted for emergency use only and it is recommended that this field be used for growing season application only.
2. It is not recommended that this site be permitted for land application at this time. For further discussion please see Section 4.1.1.

In addition to the fields outlined above the facility is also proposing to put their former solid waste disposal site into service for land application purposes. This field comprises 17.4 acres in the approximate center of the site and has been designated field A-7 (See Appendix 2, Figure 1). This field has been designated with the serial number MU-004007; however, due to the exceptionally high chemical constituent concentrations found in the upper levels of the soil, it is recommended that the field undergo remediation prior to the application of wastewater and therefore the field will not be permitted at this time. For further discussion of this recommendation and subsequent compliance activity, see Sections 4.1.1 and 4.8.

Like the Plant Farm, Salem Farm has been in use for a number of years and consequently several changes have been made with regards to its field configurations. BAF is also proposing an expansion of this site, as well as changes in certain of the field nomenclature. Please refer to Table 2 below for a description of the proposed management units and acreages at the Salem Farm.

Table 2. Management Unit Configuration at the Salem Farm

Serial Number	Site ID	Acreage	Irrigation System Type
MU-004021	S-1	119.0	Pivot
MU-004022	S-2	122.3	Pivot
MU-004023	S-3	120.3	Pivot
MU-004024	S-4[1]	N/A	N/A
MU-004025	S-5[2]	58.4	Pivot
MU-004026	S-6	40.0	Liner (GS)/Flood (NGS)
MU-004027	K-1 (corner)	9.0	Flood
MU-004028	K-2 (corner)	7.5	Flood
MU-004029	K-3 (corner)	17.0	Flood
MU-004030	K-4 (corner)	26.0	Flood
	Total acres:	**519.5**	

1. Field S-4 is a potential future land application site.

BAF has proposed adding fields A-6, S-5, and S-6 to the new permit. These proposed fields' hydraulic and constituent loading rate limitations will be evaluated further in Section 4.5.2.3 in order to more fully assess their adequacy for land application purposes.

4.5 Wastewater Flows and Constituent Loading Rates

Trending of wastewater flow rates and rationale for constituent and hydraulic loading rates appearing in the permit are discussed below.

4.5.1 Wastewater Flows

In a reflection of the facility's increasing acreage, the overall hydraulic loading has risen since the genesis of the original permit. Said permit contains a hydraulic loading limit of 0.8 MG per day (MGD) on 166 acres, or approximately 64.8 in/ac-yr, which was approximately what the facility was generating when the permit was issued in 1991. From 2004 to 2005 wastewater generation increased approximately 0.2 MGD, from 0.9 MGD to 1.1 MGD, with the installation of the new concrete-lined mud settling ponds, which replaced the old seeping silt ponds. In 2006 the facility generated approximately 1.0 MGD and land applied to a total of 530.5 acres on the combined sites, with an average wastewater loading of 26.5 in/ac-yr. This wastewater generation rate, however, represents a curtailment in production and BAF has requested that a 1.1 MGD rate be assumed. Given that the plant is considered to be operational 365 days per year this would give an approximate yearly generation rate of 401.5 MG.

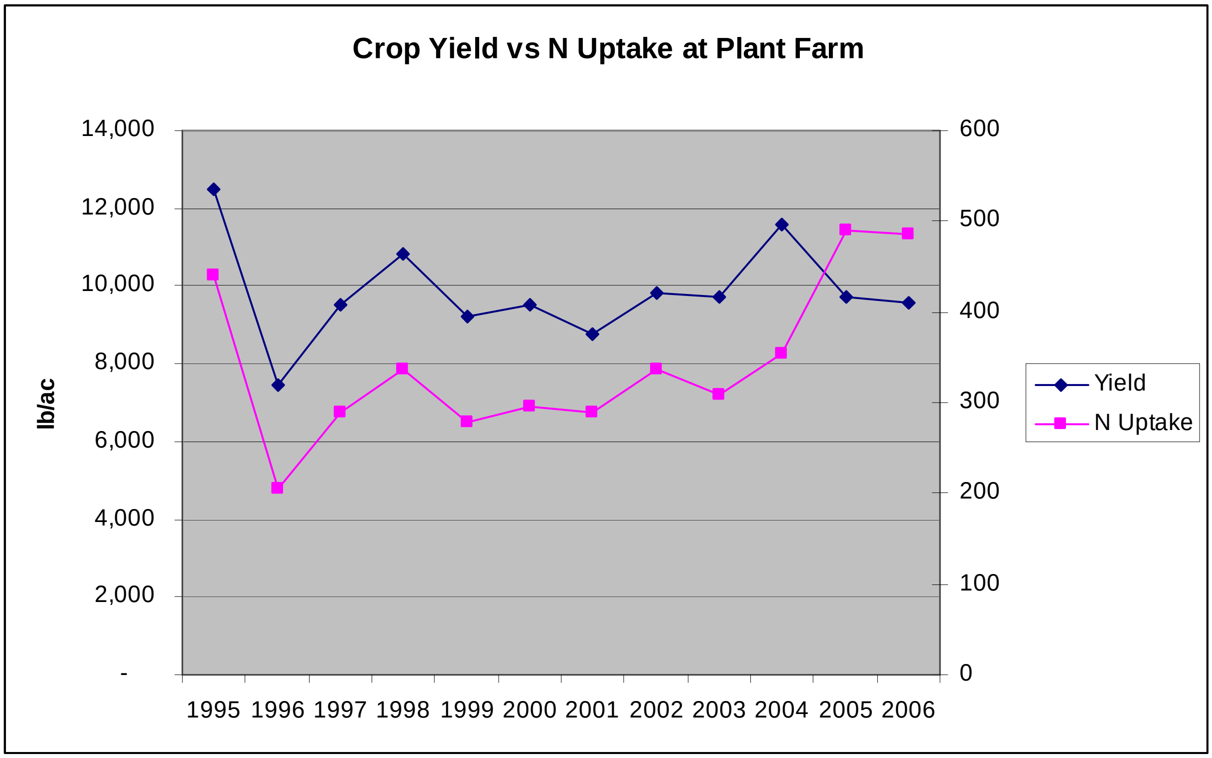
4.5.2 Constituent Loading Rates

The sections below discuss proposed constituent loading rates, including nitrogen, total dissolved solids, hydraulic, chemical oxygen demand (COD), and phosphorus. Recommended loading rates for inclusion into the permit, Section F, are also discussed.

4.5.2.1 Nitrogen Management and Loading Rates

Wastewater Reuse permits typically include a nitrogen loading rate limit of 150% of typical crop uptake, however, as permit LA-000040-01 was issued prior to the standard implementation of this guideline, it stipulated no such specific nitrogen loading limit for the facility and consequently the Plant Farm has been overloaded, at times quite severely, for many years. For several years in a row during the late 90s and beyond many of the units received over a thousand pounds per acre of nitrogen, which at times amounted to 300-500% of crop uptake. Since 2003, however, the facility has simultaneously decreased their nitrogen loading and increased crop uptake so that in 2006 only two out of the five fields at the Plant Farm, fields A-4a and A-4b, exceeded the 150% crop uptake guideline by 23% and 6%, respectively (BAF, 2007), though the accuracy of these values is somewhat suspect due to some issues which surround the crop tissue results of 2005 and 2006, a matter which will discussed later in the section. Prior to 2003 the average wastewater concentration of Total Kjeldahl Nitrogen (TKN) was approximately 100 mg/L while after 2003, due to unspecified in-plant reductions, the concentration was reduced to an average of 66 mg/L.

Initially, the main source of the facility's improved adherence to the 150% crop uptake guideline at the Plant Farm appears to have been the curtailment of wastewater loading, which has since ceased somewhat due to the company's desire to increase production. Currently, any adherence to this guideline appears to be mainly due to the marked, and suspect, increase in crop uptake which occurred in both 2005 and 2006 when the facility switched from three to four annual cuttings. Prior to 2005 the Plant Farm averaged approximately 330 lb/ac of nitrogen uptake; however, in the last two years this has increased by almost 170 lb/ac to an overall site-wide average of approximately 500 lb/ac. The facility attributes this augmentation to improved crop management practices as well as the addition of the fourth cutting per season, however, even with good management; these values are notably high for grass hay which usually averages between 50-60 lb/ton nitrogen uptake, nearly half that of the Plant Farm's average uptake of approximately 100 lb/ton (NCRS, 2007). In addition, neither the Plant Farm nor the Salem Farm showed a corresponding increase in crop yield to correspond with these increased uptake values, as illustrated by the graph below which compares the Plant Farm's averaged crop yields vs. averaged nitrogen uptake from 1995-2006.



Throughout the years the Salem Farm too, has been overloaded with respected to nitrogen, though not nearly to the same extent as the overburdened Plant Farm. During the same period in which loadings at the Plant Farm were at their highest, loading rates at Salem reached highs of 200-250% of crop uptake or around 400 to 470 lb/ac; which, while far from ideal is substantially less than the thousand pounds per acre and above loadings which were seen at the Plant Farm. In addition to the reduced loadings, crop uptake at this site also increased in 2005 to a significant extent. Prior to 2005 the average crop uptake at Salem Farm was approximately 250 lb/ac-yr, however, in 2005 the site-wide average doubled to 500 lb/ac-yr. Whether this trend continued at Salem in 2006 is difficult to determine as the facility was in the process of expanding the pivots on both S-2 and S-3 during the start of the growing season and consequently those fields had both lower yields and uptakes for the 2006 growing season due to missed cuttings.

In 2005, corresponding with the increased crop uptake, the facility both increased the number of cuttings per year and switched the lab used for analyzing crop tissue samples. Though it is possible that a portion of this significant nitrogen uptake could be attributed to the additional cutting and improved crop management, this should, in theory, be reflected in the crop yield as well as the uptake. It therefore follows that there is some possible lab error which is contributing to these elevated numbers. It is recommended that the facility, and thereby their analytical lab, be required to submit and adhere to a Quality Assurance Project Plan (QAPP) for monitoring and sampling which covers laboratory analytical methods, data verification and validation, data storage, retrieval and assessment, and monitoring program evaluation and improvement. For the full text of the compliance activity see CA-040-03 in Section E of the permit. It is also recommended that the facility consider ensuring that all labs used for compliance testing be members of the North American Proficiency Testing Program (NAPT).

Despite the question of the accuracy of the recent crop uptake values, with the addition of the three additional fields, one at the Plant Farm and two at the Salem Farm, as well as proper crop and hydraulic loading management, the facility should be able to achieve compliance with the 150% of crop uptake guideline. It is therefore recommended that this limit be included in the draft permit; see Section F for the of the permit for the full text of the condition.

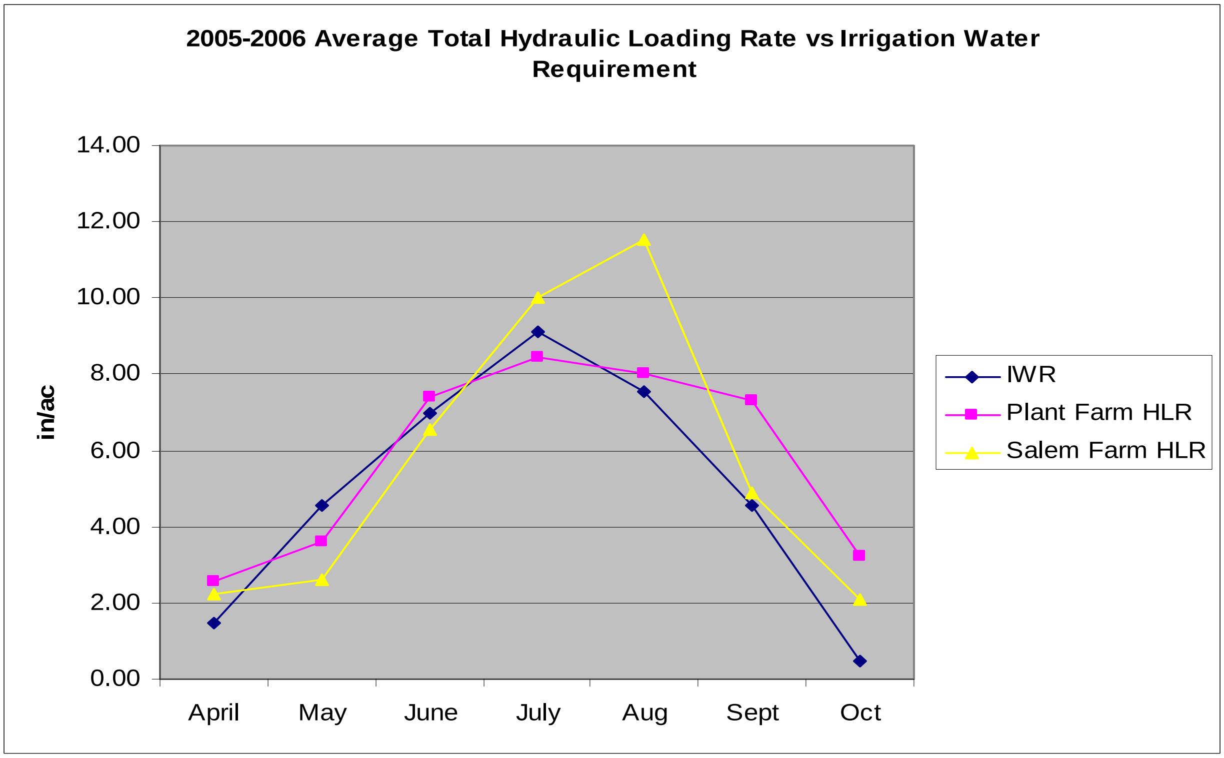
4.5.2.2 Total Dissolved Solids (TDS) Loading Rates

Total dissolved solids (TDS) loading rates from wastewater and irrigation water can have significant impacts to ground water TDS levels. Total dissolved solids measured in ground water are commonly inorganic constituents (salts). TDS in wastewater can include significant quantities of organic constituents in addition to salts. For modeling and other environmental evaluation purposes, inorganic wastewater TDS is important to measure. While the original permit does not require the measurement of either TDS or volatile dissolved solids (VDS), a rough estimate of organic constituents, the facility has sampled for both on a number of occasions in recent years. The difference between TDS and VDS is termed non-volatile dissolved solids (NVDS) and can be used as a rough estimate of the salts in wastewater. Since November of 2001, when the facility began sampling, TDS concentrations in the wastewater have remained relatively constant, with an average concentration of approximately 1,090 mg/L.

The facility projects their average NVDS loading to be approximately 3,800 lb/ac, which represents an improvement over historic levels (HDR, 2006). As has been discussed previously, there are several wells at the Plant Farm which consistently show TDS levels above the acceptable ground water quality standard, pointing to some probable influence due to constituent and hydraulic loading rates. Due to these levels it is recommended that the draft permit include the NVDS loading limit of 4,500 lb/ac-yr proposed by the facility.

4.5.2.3 Hydraulic Loading Rates

In theory, growing season hydraulic loading should substantially be the irrigation water requirement (IWR) for the crop in question. Though information regarding the facility’s supplemental irrigation rates has only been reported in recent years, it appears as though growing season hydraulic loading is taking place at roughly agronomic rates, as evidenced by the graph below which illustrates the averaged total hydraulic loading to the Plant Farm and the Salem Farm for 2005 and 2006 compared with the 15 year irrigation water requirement for grass hay from the U.S. Bureau of Reclamation AgriMet Station in the Rexburg area (Allen, 2007)



It is likely that partially as a result of these hydraulic loadings both reported crop yield and nutrient uptake have been above average for the aforementioned years. Average crop yield for irrigated alfalfa hay in Madison county, including grass hay, according to the USDA's National Agriculture Statistics Service (NASS), for 2005-2006 was 4.75 ton/ac (NASS, 2007) whereas the Plant Farm averaged 4.8 ton/ac in 2005-2006 and the Salem Farm averaged 5.2 ton/ac in 2005 (BAF, 2005-2006). In order to continue to maintain these productive yields, staff recommends that the IWR be calculated using crop-specific evapotranspiration (ET_c) data from the Rexburg, Idaho AgriMet Station (RXGI) so that the facility can continue to irrigate at the appropriate rates. For the full text of this condition see Section F of the permit.

The facility's original permit contains no non-growing season (NGS) hydraulic loading limit but rather a permit stipulation which states that application rates shall be adjusted to attempt to prevent wastewater from forming ice layers greater than six inches during the winter months. Such a guideline is no longer sufficient to prevent hydraulic overloading or nuisance odor production during the course of the non-growing season. Currently, DEQ typically calculates NGS hydraulic loading rates based off the following formula:

HLR_{ngs}= Soil Available Water-Holding Capacity (AWC) – Precipitation + Evapotranspiration

However, given the relatively low AWCs of several of the fields, including the bulk of the Salem Farm, this formula leads to rather limited NGS loading rates, which, without the addition of a fairly large retention system or a substantial addition of acreage, would not be at all feasible for the facility. In the permit application submitted in November 2006, alternate NGS loading rates were proposed which are approximately 92% greater than those typically recommended by DEQ; they are, however, also 14% greater than projected generation rates, and 14-39% greater than 2005-2006 NGS application rates. DEQ feels that the facility failed to provide adequate justification to support their proposed loading rates; so instead of permitting these higher rates, which total approximately 188.9 MG and could further the promotion of both anoxic soil conditions and their consequent ground water effects, it is recommended that the sites be permitted for a total which roughly equals the projected generation rate of 166.1 MG.

Consequently, it is recommended that the permit include the proposed non-growing season loading rates which are as follows:

Table 3. Non-Growing Season Hydraulic Loading Rates – Plant Farm

HMU	Acres	AWC	in/ac	MG
A-1 (MU-004001)	25.3	8.3	13.9	9.6
A-2 (MU-004002)	47.8	8.3	13.9	18.0
A-3 (MU-004003)	29.0	8.3	13.9	11.0
A-4 (MU-004004)	22.7	5.4	9.2	5.7
A-5 (MU-004005)	24.4	4.1	6.9	4.6
A-6 (MU-004006)*	17.6	----	----	----
C-1 (MU-004008)	4.5	3.5	5.9	0.7
C-2 (MU-004009)	13.4	8.3	13.9	5.1
C-3 (MU-004010)	8.5	8.3	13.9	3.2
C-4 (MU-004011)	9.5	8.3	13.9	3.6
			Total:	61.4

* A-6 is to be used for growing season application only.

Table 4. Non-Growing Season Hydraulic Loading Rates- Salem Farm

HMU	Acres	AWC	in/ac	MG
S-1 (MU-004021)	119.0	4.4	7.4	23.9
S-2 (MU-004022)	122.3	4.4	7.4	24.6
S-3 (MU-004023)	120.3	4.4	7.4	24.2
S-5 (MU-004025)	58.4	4.5	7.6	12.1
S-6 (MU-004026)	40.0	4.4	7.4	8.0
K-1 (MU-004027)	9.0	4.4	7.4	1.8
K-2 (MU-004028)	7.5	4.4	7.4	1.5
K-3 (MU-004029)	17.0	4.4	7.4	3.4
K-4 (MU-004030)	26.0	4.4	7.4	5.2
			Total:	104.7

While these rates are still higher than what would typically be recommended, if adhered to they should be less detrimental than current practices due to the fact that wastewater will be distributed more accurately according to the sites' various AWCs. At the same time these rates are similar to both current (2005-2006) and projected production values, and actually lower than the 10-year average loadings, which indicates that while they are not has high as the proposed non-growing season hydraulic loadings, these limits are within reach for the facility. It is therefore recommended that the field-specific loading rates contained above in Table 3 and Table 4 be included in the permit. For the full text of this condition see Section F of the permit.

4.5.2.4 COD Loading Rates

Wastewater Reuse permits typically include a chemical oxygen demand (COD) permit loading rate limit of 50 pounds/acre-day (lb/ac-day) per season, however, like the nitrogen loading limit, LA-000040-01 was issued prior to this recommendation and therefore no COD loading limit was included in the original permit. Again, as a result of this the Plant Farm experienced a number of years where seasonal COD loadings, in both the growing and non-growing season, were quite high, at upwards of 100 lb/ac-day and beyond. The Salem Farm, however, did not experience the same kind of high loading rates and has consistently remained below the 50 lb/ac-day seasonal average limit since 1995 on all fields.

Like the nitrogen loading rates, COD loading rates experienced a drop after 2003, particularly at the Plant Farm. This is presumably due to both the aforementioned reduced hydraulic loading rates as well as an apparent drop in constituent concentration in the wastewater itself. Prior to 2003 the average COD concentration of the wastewater was approximately 2,520 mg/L; however, since 2003 the average has been closer to 1,600 mg/L. This reduced concentration has lead to an average seasonal loading rate of 27 lb/ac-day for the non-growing season and 39 lb/ac-day for the growing season at the Plant Farm and 24 lb/ac-day for the non-growing season and 21 lb/ac-day for the growing season at the Salem Site. It is clear, particularly given inclusion of the additional acreage, that even with the projected increase in wastewater generation BAF should be able to continue to meet the 50 lb /ac-day seasonal average COD standard. However, due to the higher-than-guideline rate NGS hydraulic loadings being allowed on both sites, it is recommended that the facility be held to a 25 lb/ac-day COD seasonal average loading limit during the non-growing season out of possible ground water contamination concerns. During the growing season, staff recommends the typical 50 lb/ac-day per season loading rate limit. For the full text of the condition, see Section F of the permit.

4.5.2.5 Phosphorus Loading Rates

Generally, phosphorus loading rate limits are set by DEQ based upon either ground water or surface water concerns. As has been previously mentioned, the Plant Farm, and most likely the Salem Farm, features a just such a ground water to surface water interconnection. In light of this, since ground water at both sites is generally more than five feet below the surface and given the soil pH, DEQ guidance recommends that phosphorus levels between 24”-36” be less than 50 parts per million (ppm) (DEQ, 2006). At both sites the extremely high phosphorus levels appear to be concentrated in the upper rooting levels of the soil, between 0”-24”, however, concentrations within the lower level are hovering close to the 50 ppm boundary, particularly at the Salem Farm.

Since 2002, the facility has loaded an average of 120 lb/ac-yr of phosphorus to the Plant Farm and 70 lb/ac-yr to the Salem Farm. Estimated phosphorus uptake values for grass hay under optimum growing conditions with yields at 8 ton/ac is 40 lb/ac, which means that the facility is applying approximately 300% of crop uptake at the Plant Farm and 175% of crop uptake at the Salem Farm (DEQ, 2007). However, as neither the ground water nor nearby surface waters appear to be showing impacts from these application rates, and as there is no ground water standard established for phosphorus, it is not recommended that a phosphorus loading limit be included in the permit at this time. The Department will, however, reserve the right to re-open the permit for inclusion of such a limit should future conditions deem it to be necessary.

4.7 Buffer Zone and Site Management

Neither the 2003 application nor the update submitted in 2006 contains any specific discussion of odor or solids management, or buffer zones, rather the 2006 addendum stipulates that a buffer zone plan will be included in the Plan of Operation as part of an expected compliance activity. While the Plan of Operation is indeed counted among the number of recommended compliance activities for the draft permit, it is also recommended that the standard buffer zones for industrial reuse sites be adhered to unless the facility can provide adequate justification otherwise; said buffer zones are as follows:

- 300 ft from reuse site and inhabited dwellings
- 50 ft from reuse site and areas accessible by the public
- 100 ft from reuse site and permanent and intermittent surface water

- 50 feet from reuse site and irrigation ditches and canals
- 500 feet from reuse site and private water supply wells
- 1000 feet from reuse site and public water supply wells
- Berms and other BMPs shall be used to protect the well head of on-site wells.

In addition to the above recommendations, several qualifications must be made with regards to the facility's odor management plan. Due to a number of factors, including the duration of time that the wastewater spends in the pipeline to the site, the Salem Farm has been a fairly significant source of non-growing season odors and therefore odor complaints. On September 7, 2007, BAF submitted a Nuisance Odor Management Plan to address these issues. The plan addresses each potential source of odor generating conditions individually and the methods currently employed for the prevention of the formation of these conditions. With regard to the facility's most significant odor source, the Salem Farm and its pipeline, the plan states that while in the past the system has been operated improperly, resulting in extended wastewater retention time, this will not be the case in the future. Designs for improving conditions at the Salem Farm include pigging the pipeline once or twice per day and introducing caustic into the line every two days or when daily hydrogen sulfide tests indicate levels higher than 0.3. In addition, upon completion of each irrigation cycle, process water will be evacuated from the pivot distribution system via compressed air (BAF, 2007). If adhered to, this Nuisance Odor Management Plan should help prevent the majority of odors from the land application sites, barring plant upset conditions; therefore it is recommended that it be incorporated by reference into the permit (Section B).

With regard to the Solids Management Plan, BAF submitted a letter on May 23rd of 2007 containing further details as to the conversion of the former solids management site into field A-7 as well as a general description of their plans for waste solids distribution in the future. The letter stated that wastewater distribution to the former tare dirt site was to begin following the issuance of the new permit and that waste solids would now be systematically distributed to portions of A-4, A-5, and A-6 to improve soil quality. The proposed plan to begin applying wastewater to A-7 following the issuance of the new permit, however, is inadvisable given the extremely high constituent concentrations already present in the upper levels of the soil, previously discussed in Section 4.1.1, and is not recommended until such time as levels have receded to a more acceptable range (See Compliance Activity 040-05 of the draft permit). These same high consistent concentrations may prove to be an issue with the new application sites as well, particularly given the sites' shallow ground water and proximity to the river, if the distribution is not closely monitored. Consequently, it is recommended that a thorough and detailed Waste Solids Management Plan be submitted for review and approval prior to placing solids on fields A-4, A-5, or A-6.. For the full text of this compliance activity see CA-40-02, Section E of the permit.

4.8 Plan of Operation and Other Compliance Activities

Section 1.0 of the Application (page 1) states that an updated facility plan of operation would be submitted after permit issuance as an anticipated permit compliance condition; it is understood that a plan of operation is a living document and is modified as operations and regulatory requirements change. Section E , condition CA-040-01, as it appears in the permit, attached, requires the facility to submit for DEQ review and approval, a plan of operation which includes, but is not limited to, all of the information required by the latest revision of the Plan of Operation Checklist in the Reuse Program Guidance. For the full text of the condition, see CA-040-01, Section E of the draft permit.

With the facility's desire to begin using their former waste solids management site for land application purposes it is necessary that a new plan for solids disposal be designed. As such, it is recommended that a Waste Solids Management Plan be submitted which describes how waste solids will be handled in the future. For the full text of this condition see CA-040-02, Section E of the permit.

It is recommended that a Quality Assurance Project Plan (QAPP) for monitoring be required in this permit in order to address prior sampling inconsistencies which the facility has experienced with a number of their monitoring parameters in the past. For the full text of this condition see CA-040-03, Section E of the permit.

In order to address the aforementioned issues with the application of wastewater to field A-7, the facility's former waste solids management site, it is recommended that the facility be required to submit a Site Remediation Plan, as discussed in Section 4.1.1, complete with a schedule of implementation and subsequent soil sampling, as well as target soil constituent levels to be achieved in order for the site to acceptable for land application. For the full text of this compliance activity see the Section E in CA-040-05 of the permit.

It is recommended that all of the ground water monitoring wells designated as active in Appendix 1 of the permit be resurveyed by an Idaho licensed land surveyor or engineer. Horizontal locations shall be specified using the Public Land Survey system with accuracy to the nearest third quarter (i.e. Township, Range, Section, ¼, ¼, ¼). Vertical locations to top of casing shall be determined relative to a universally recognized vertical datum and specified to an accuracy of plus/minus one-hundredth of a foot (± 0.01 ft). For the details of this compliance activity, see CA-040-06 in Section E of the permit. If a survey by one of the aforementioned professionals has, in fact, been performed previously, it is requested that documentation to this effect be produced as fulfillment of the requirements of the compliance activity.

Staff also recommends that a Ground Water Characterization Plan be submitted which includes the improvement of the monitoring well network, via recompletion of existing wells and/or the addition of new ones so that wells yield samples throughout the year. For the full text of this compliance activity see CA-40-07 in Section E of the permit.

It is recommended that well location acceptability analyses be performed for all domestic and municipal wells within a ¼ mile radius of either reuse site and for those municipal or domestic wells which are located on the reuse sites themselves. For the full text of this compliance activity see CA-040-08 in Section E of the permit.

Staff also recommends that a comprehensive Runoff Management Plan with control structures and other BMPs (e.g. collection basins, berms, etc.) designed to prevent runoff from any site or fields used for wastewater reuse to property not owned by BAF except in the event of a 25-year, 24-hour storm event or greater, using Western Regional Climate Center (WRCC) Precipitation Frequency Map, Figure 28, 'Isopluvials of 25-YR, 24-HR Precipitation' be designed and implemented. For the full text of this compliance activity see CA-040-09 in Section E of the permit.

In addition to these compliance activities, the mud lagoons installed at the facility in 2004 have yet to be seepage tested. Compliance Activity CA-040-04 requires that the appropriate testing and repairs, if necessary, be performed. For the full text of this activity see Section E of the permit.

5.0 Conclusion

The following recommendations fall into three major areas. They include loading rate related recommendations, ground water related recommendations, and other recommendations.

5.1 Loading Rate Related Recommendations

1. It is recommended that all hydraulic fields be managed and loaded hydraulically during the NGS according to rates proposed for each hydraulic field, discussed in Section 4.5.2.3. See Section F of the permit.

2. COD loading rates should be 50 lb/acre-day for the growing and 25 lb/ac-day for the non-growing season as discussed in Section 4.5.2.4. See Section F of the permit.

3. It is recommended that all fields have a nitrogen loading rate of 150% of median crop uptake as discussed in Section 4.5.2.1. See Section F of the permit.

4. It is recommended that all fields have a NVDS loading rate of 4,500 lb/ac-yr as discussed in Section 4.5.2.2. See Section F of the permit.

5.2 Ground Water Related Recommendations

1. It is recommended that the ground water monitoring network at the Salem Farm be re-evaluated and revised as needed to properly monitor the site as discussed in Section 4.2.2. See Compliance Activity CA-040-07 in Section E of the permit.

2. It is recommended that the T-series wells at the Plant Farm be resurveyed as discussed in Section 4.2.1. See Compliance Activity CA-040-06 in Section E of the permit.

3. It is also recommended that well location acceptability analyses be performed for all domestic and municipal wells within a ¼ mile radius of either reuse site and for those wells which are located on the reuse sites themselves as discussed in Section 4.2.3. For the full text of this compliance activity see CA-040-08 in Section E of the permit.

5.3 Other Recommendations

It is recommended that the additional acreage be permitted for land treatment and that the field designations be revised as discussed in Section 4.4. See Section F of the attached permit.

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Appendix 1

Table 1. Total vs. Dissolved Fe and Mn Ground Water Concentrations 2004- 2006- Plant Farm

Date	Well	Total Fe	Dis. Fe	Total Mn	Dis. Mn
3/29/04	T-1	**4.47**	<0.05	**0.17**	**0.09**
7/27/04	T-1	**1.23**	<0.05	**0.07**	**0.06**
11/2/04	T-1	**1.26**	<0.05	**0.16**	**0.13**
7/15/05	T-1	**1.10**	**0.47**	<0.05	<0.05
11/3/05	T-1	**1.23**	0.21	<0.05	<0.05
3/20/06	T-1	**0.39**	**0.33**	**1.09**	**1.08**
7/25/06	T-1	**1.51**	**0.38**	**0.20**	**0.19**
3/29/04	T-2	**1.85**	<0.05	0.04	0.01
7/27/04	T-2	**9.23**	<0.05	**0.13**	**0.11**
11/2/04	T-2	**3.15**	<0.05	**0.33**	**0.28**
7/15/05	T-2	**13.80**	**0.95**	**0.27**	<0.05
11/3/05	T-2	**2.46**	0.17	**0.22**	**0.14**
7/26/06	T-2	**0.96**	0.21	<0.05	<0.05
3/29/04	T-3	**5.11**	<0.05	**0.17**	**0.09**
7/27/04	T-3	**1.38**	<0.05	**0.20**	**0.18**
11/2/04	T-3	**2.21**	<0.05	**0.31**	**0.28**
11/3/05	T-3	**6.42**	**1.02**	**0.24**	**0.22**
3/20/06	T-3	**4.07**	<0.10	**0.10**	**0.09**
7/25/06	T-3	**4.06**	<0.10	**0.11**	**0.09**
3/29/04	T-4	**1.95**	<0.05	0.04	0.02
7/27/04	T-4	**2.67**	<0.05	**0.06**	**0.05**
11/02/04	T-4	**1.82**	<0.05	**0.21**	**0.18**
3/15/05	T-4	**1.22**	<0.10	<0.05	<0.05
7/15/05	T-4	**0.82**	0.24	<0.05	<0.05
11/3/05	T-4	**8.16**	0.12	**0.06**	<0.05
7/25/06	T-4	**1.78**	0.17	<0.05	<0.05
7/27/04	T-5	**24.00**	**0.35**	**3.49**	**3.21**
7/25/06	T-5	**20.1**	**16.6**	**2.84**	**2.69**
7/27/04	T-6	**16.70**	<0.05	**1.33**	**1.18**
7/15/05	T-6	**10.1**	**9.17**	**1.4**	**1.34**
7/25/06	T-6	**9.59**	**7.35**	**1.03**	**1.03**
7/27/04	T-8	**5.76**	<0.05	**0.15**	<0.05
11/20/04	T-8	**1.95**	<0.05	0.02	0.01
7/15/05	T-8	<0.1	<0.10	<0.05	<0.05
11/3/05	T-8	**6.66**	<0.10	**4.73**	<0.05
7/25/06	T-8	**3.74**	<0.10	**0.07**	<0.05
7/27/04	T-9	**0.73**	<0.05	0.01	<0.005
7/15/05	T-9	0.22	<0.10	<0.05	<0.05
7/25/06	T-9	**0.69**	<0.10	<0.05	<0.05
3/29/04	T-10	**1.70**	<0.05	**3.80**	**3.68**
7/27/04	T-10	**2.34**	<0.05	**2.61**	**2.48**
11/2/04	T-10	**1.82**	0.06	**3.77**	**3.34**
3/15/04	T-10	**3.98**	**3.53**	**3.86**	**3.60**
7/15/05	T-10	**1.84**	**1.57**	**4.81**	**4.61**
11/3/05	T-10	**1.48**	**1.37**	**4.73**	**4.45**
3/20/06	T-10	**2.36**	**2.25**	**3.10**	**3.04**

1. Bold denotes result that is in exceedance of IDAPA 58.01.11 Primary or Secondary Ground Water Standard
2. < denotes result which is less than the corresponding method reporting limit.

Table 2. Total vs. Dissolved Fe and Mn Ground Water Concentrations 2004-2006 Well FM-1, Salem Farm

Date	Well	Total Fe	Dis. Fe	Total Mn	Dis. Mn
7/26/04	FM-1	**6.43**	0.21	**0.83**	**0.65**
11/3/04	FM-1	**6.30**	**0.65**	**0.92**	**0.77**
7/15/05	FM-1	**4.55**	**0.80**	**4.54**	**0.80**
11/14/05	FM-1	**7.61**	**6.88**	**1.12**	**1.07**

7/25/06	FM-1	**4.98**	**4.86**	**0.69**	**0.68**
11/25/06	FM-1	**4.98**	**4.79**	**0.75**	**0.71**

1. Bold denotes result that is in exceedance of IDAPA 58.01.11 Primary or Secondary Ground Water Standard

Appendix 2

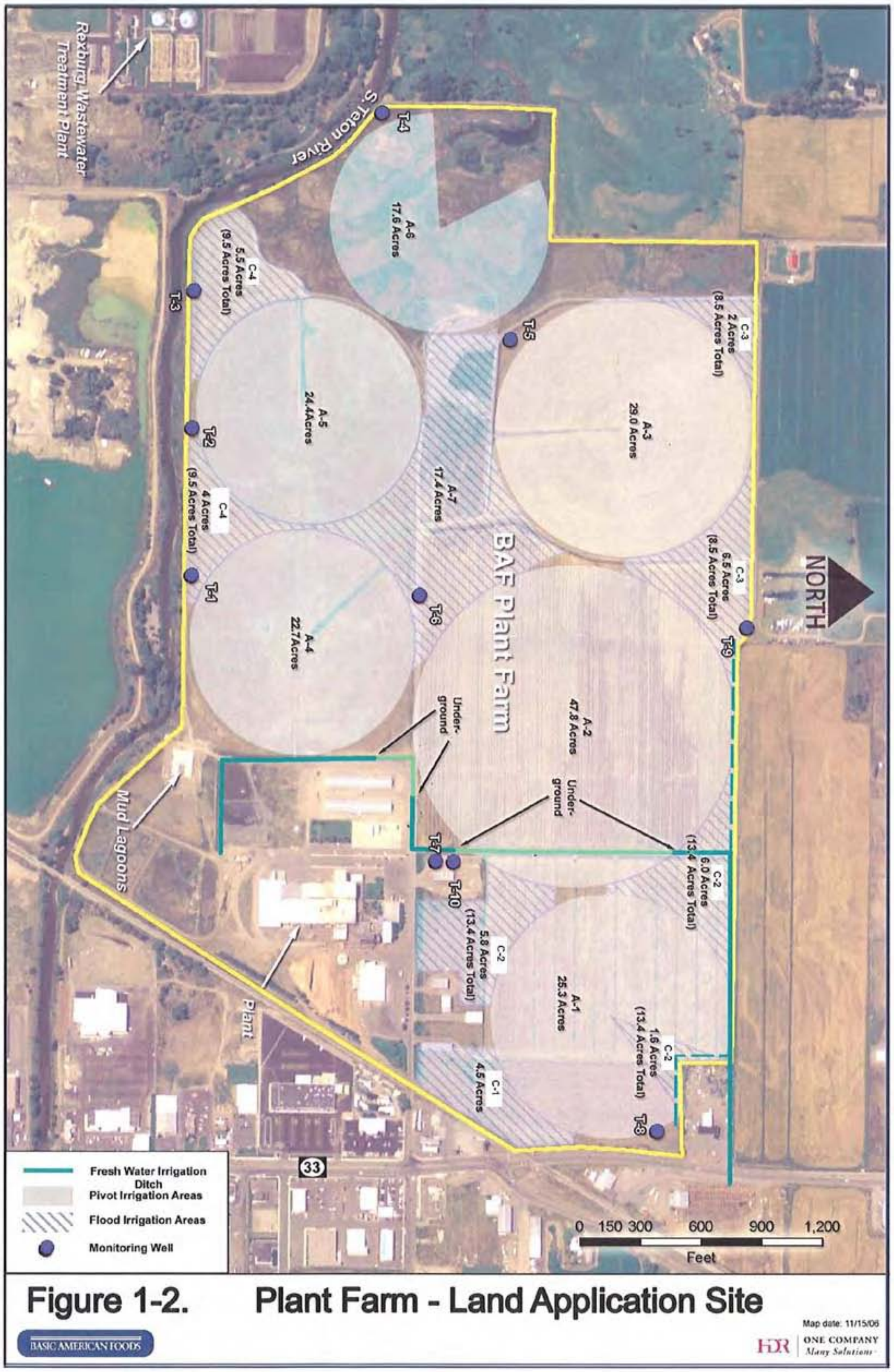

Figure 1. Management Unit Configurations and Well Locations—Plant Farm.

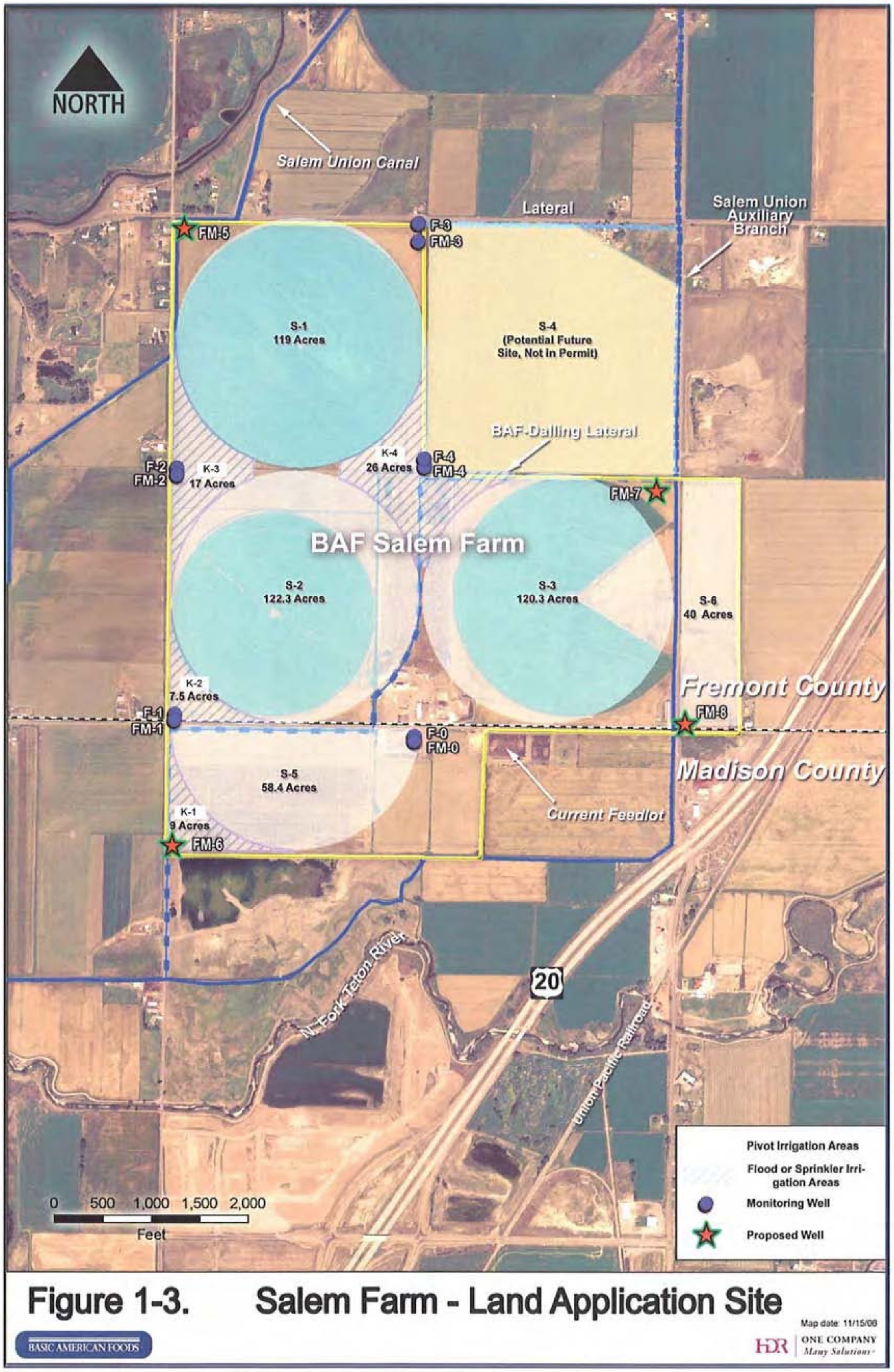

Figure 2. Management Unit Configurations and Well Locations—Salem Farm